PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2003-257659
(43)Date of publication of application : 12.09.2003

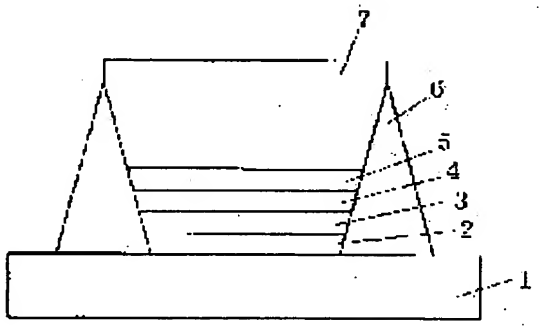
(51)Int.Cl. H05B 33/14
H04M 1/02
H04M 1/03
H05B 33/02
H05B 33/12
H05B 33/22

(21)Application number : 2002-050972
(22)Date of filing : 27.02.2002

(71)Applicant : MATSUSHITA ELECTRIC IND CO LTD
(72)Inventor : HAMANO TAKASHI
SUGIURA HISANORI
WAKITA HISAHIDE

(54) ORGANIC ELECTRO-LUMINESCENCE ELEMENT, IMAGE FORMING DEVICE USING THE ELEMENT, AND PORTABLE TERMINAL

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an organic electro-luminescence element and an image forming device having an excellent visibility and capable of maintaining a highly efficient light emitting performance, and a portable terminal low in weight and long in usable time.
SOLUTION: This organic electro-luminescence element comprises an anode for filling holes, a light emitting layer having a light emitting area, and a cathode for filling electrons installed on a substrate. Light radiated from the light emitting layer is extracted from a surface opposite to the substrate, and an inverse V-shaped structure higher than the light emitting layer is formed on at least a part of the element forming surface of the substrate.



LEGAL STATUS

[Date of request for examination] 16.02.2005

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The light which is the organic electroluminescent element equipped with the anode plate which pours in an electron hole at least, the luminous layer which has a luminescence field, and the cathode which pours in an electron, and is emitted from said luminous layer on a substrate is an organic electroluminescent element characterized by being taken out from a substrate and the field which counters and forming the reverse V typeface structure higher than a luminous layer in a part of component forming face [at least] of said substrate.
[Claim 2] The optical ejection side of said organic electroluminescent element is an organic electroluminescent element according to claim 1 characterized by flattening being carried out by the transparence flattening structure formed with the transparent ingredient.
[Claim 3] Said reverse V typeface structure is an organic electroluminescent element according to claim 1 or 2 characterized by reflecting light.
[Claim 4] said reverse V typeface structure -- said transparence flattening structure -- low -- the organic electroluminescent element according to claim 2 characterized by being formed with the refractive index ingredient.
[Claim 5] Said transparence flattening structure is claim 2 characterized by being formed on the protective coat formed in said organic electroluminescent element front face thru/or an organic electroluminescent element given in the inside 1 [any] of 4.
[Claim 6] Said reverse V typeface structure is claim 1 characterized by being formed in bilateral symmetry thru/or an organic electroluminescent element given in the inside 1 [any] of 5.
[Claim 7] Said reverse V typeface structure is claim 1 characterized by being formed in right-and-left asymmetry thru/or an organic electroluminescent element given in the inside 1 [any] of 5.
[Claim 8] Said reverse V typeface structure is claim 1 characterized by being formed in the shape of [the cross-section configuration of whose is two of V typefaces] a straight line thru/or an organic electroluminescent element given in the inside 1 [any] of 7.
[Claim 9] Said reverse V typeface structure is claim 1 characterized by forming the cross-section configuration in the inside of V typeface in the shape of [****] a curve thru/or an organic electroluminescent element given in the inside 1 [any] of 7.
[Claim 10] Image formation equipment which said anode plate and said cathode of claim 1 thru/or an organic electroluminescent element given in the inside 1 [any] of 9 are separated and constituted by the individual electrical-and-electric-equipment target in the shape of a stripe, has the image display array which it becomes from two or more pixels, and is characterized by the direction of in the substrate side of said reverse V typeface structure and the direction of the pixel formed with a stripe electrode being the same.
[Claim 11] It is image-formation equipment which said anode plate or said cathode of claim 1 thru/or an organic electroluminescent element given in the inside 1 [any] of 9 is separated and constituted by the individual electrical-and-electric-equipment target for every pixel, and said separated electrode is scanned through at least one or more switching elements, has an image-display array, and is characterized by for the direction of in the substrate side of said reverse V typeface structure and the direction of a pixel to be the same.
[Claim 12] The core of said reverse V typeface structure that the pitch of each direction of said reverse V typeface structure spreads the pitch of each direction of said light-emitting part corresponding to said each pixel, abbreviation, etc. is image formation equipment according to claim 10 or 11 characterized by being in the abbreviation midpoint which connects the core of each of said pixel.
[Claim 13] The height of said transparence flattening structure is image formation equipment according to

claim 10 or 11 characterized by being lower than the sum of the height of said reverse V typeface structure, and the width of face of the direction of a flat surface of a pixel.
[Claim 14] A sound signal conversion means to change voice into a sound signal, and an actuation means to input the telephone number etc., A display means to display an arrival-of-the-mail display, the telephone number, etc., and the means of communications which changes a sound signal into a sending signal, A receiving means to change an input signal into a sound signal, and the antenna which transmit and receive said sending signal and said input signal, The personal digital assistant which is a personal digital assistant equipped with the control means which controls each part, and is characterized by said display means consisting of image formation equipment of a publication in claim 10 thru/or the inside 1 [any] of 13.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the organic electroluminescent element used for the light emitting device used for the light source of various image formation equipments or image formation equipment, a back light, or an optical-communication device, the image formation equipment using it, and a personal digital assistant.
[0002]
[Description of the Prior Art] An electroluminescent element is a luminescence device using the electroluminescence of the solid-state fluorescence matter, inorganic electroluminescence using the current inorganic system ingredient as an illuminant is put in practical use, and application expansion to a back light, a flat display, etc. of a liquid crystal display is achieved partly. However, the electrical potential difference required in order to make light emit of inorganic electroluminescence is as high as more than 100V, and since blue luminescence is moreover difficult, full-color-izing by the three primary colors of RGB is difficult for it. Moreover, since inorganic electroluminescence has the very large refractive index of the ingredient used as an emitter, it is strongly influenced of the total reflection in an interface etc., the ejection effectiveness of the light to the inside of the air over actual luminescence is as low as about 10 - 20%, and efficient-izing is difficult for it.
[0003] On the other hand, although the research on the electroluminescence using an organic material also attracted attention for many years and various examination had been performed, luminous efficiency did not progress to full-fledged utilization research from a very bad thing.
[0004] However, the organic electroluminescent element which will have the laminated structure of the functional discrete type which divided the organic material into two-layer [of an electron hole transportation layer and a luminous layer] by C.W.Tang and others of KODAKKU in 1987 was proposed, and it became clear that two or more 1000 cd/m high luminescence brightness is obtained in spite of the low battery not more than 10V [refer to C.W.Tang and S.A.Vanslyke:Appl.Phys.Lett and 51 (1987) 913 grade]. **** attention of the organic electroluminescent element begins to be carried out after this, research on the organic electroluminescent element which has the laminated structure of the same functional discrete type still now is done briskly, in order to be especially utilization of an organic electroluminescent element, examination is enough made also about indispensable efficient-izing and reinforcement, and the display using an organic electroluminescent element etc. is manufactured in recent years.
[0005] Here, the configuration of the conventional general organic electroluminescent element is explained using drawing 6 .
[0006] Drawing 6 is the important section sectional view of the conventional organic electroluminescent element.
[0007] In drawing 6 , glass substrates 1 are the anode plate where 1 was formed on the glass substrate 1, the electron hole transportation layer by which 3 was formed on the anode plate 2, the luminous layer by which 4 was formed on the electron hole transportation layer 3, and the cathode where 5 was formed on the luminous layer 4.
[0008] As shown in drawing 6 , an organic electroluminescent element The anode plate 2 which consists of transparent conductive film, such as ITO formed by the sputtering method, resistance heating vacuum deposition, etc. on the glass substrate 1, N and N' which were formed by resistance heating vacuum deposition etc. the same on an anode plate 2 - diphenyl-N and N' -- the - screw (3-methylphenyl) -1 and 1' - diphenyl -4 and 4' -- with the electron hole transportation layer 3 which consists of - diamine (henceforth TPD) etc. 8-Hydroxyquinoline formed by resistance heating vacuum deposition etc. on the electron hole

transportation layer 3 The luminous layer 4 which consists of Aluminum (henceforth Alq3) etc., It has the cathode 5 which consists of a metal membrane of the 100-300nm thickness formed by resistance heating vacuum deposition etc. on the luminous layer 4.

[0009] When direct current voltage or a direct current is impressed by making cathode 5 into a minus pole, using as a plus pole the anode plate 2 of the organic electroluminescent element which has the above-mentioned configuration, an electron hole is poured into a luminous layer 4 through the electron hole transportation layer 3 from an anode plate 2, and an electron is poured into a luminous layer 4 from cathode 5. In a luminous layer 4, the recombination of an electron hole and an electron arises, and in case the exciton generated in connection with this shifts to a ground state from an excitation state, luminescence happens.

[0010] In such an organic electroluminescent element, outgoing radiation of the light emitted from the fluorescent substance in a luminous layer is carried out to the omnidirection centering on a fluorescent substance, with the direction of optical ejection, it is once reflected toward hard flow via an electron hole transportation layer, an anode plate, and a glass substrate in cathode, and it is usually emitted into air via a luminous layer, an electron hole transportation layer, an anode plate, and a glass substrate. However, since total reflection of the light which carries out incidence at the include angle from which the outgoing radiation angle of a refracted wave is set to 90, i.e., a bigger include angle than a critical angle, is carried out when the refractive index of the medium by the side of incidence is larger than the refractive index by the side of outgoing radiation in case light passes through the interface of each medium, an interface cannot be penetrated and it is not taken out into air.

[0011] Here, the relation of the optical refraction angle in the interface of a different medium and the refractive index of a medium follows a Snell's law. According to the Snell's law, when light advances from the medium of a refractive index n1 to the medium of a refractive index n2, the relation it is unrelated n1sintheta1=n2sintheta2 between the incident angle theta 1 and angle of refraction theta 2 is realized. Therefore, when n1>n2 are realized, incident angle theta1=sin-1 (n2/n1) used as theta2=90 degree is well known as a critical angle, and when an incident angle is bigger than this, total reflection of the light will be carried out in the interface between media.

[0012] Therefore, in the organic electroluminescent element by which a light emission is carried out isotropic, the light emitted at a bigger include angle than this critical angle repeats the total reflection in an interface, is confined in the interior of a component, and is no longer emitted into air.

[0013] Drawing 7 is the mimetic diagram showing the typical beam-of-light path in the important section cross section of the conventional organic electroluminescence element.

[0014] For a glass substrate 1, as for an electron hole transportation layer and 4, in drawing 7 , an anode plate and 3 are [1 / a luminous layer and 5] cathode. As shown in drawing 7 , the light emitted from the light source 8 of the light emitted out of the luminous layer 4 sets to each interface, such as an interface (ITO / glass interface) of an anode plate 2 and a glass substrate 1, and an interface (glass / air interface) of a glass substrate 1 and air. At an include angle with the bigger outgoing radiation angle of a refracted wave than a critical angle, when the refractive index of light of the medium by the side of incidence is larger than the refractive index by the side of outgoing radiation, since total reflection is carried out, that at the time of incidence cannot penetrate an interface, and is not taken out into air.

[0015] The light emitted in a luminous layer is not emitted to the component exterior, but this causes degradation on appearance as an organic electroluminescent element. Generally, as for the synchrotron orbital radiation obtained by the luminous layer of an organic electroluminescent element, most is confined in the interior of a component by total reflection, and it is known that being used as effective synchrotron orbital radiation is 17% to about 20% [refer to Advanced Material6 (1994) 491 grade].

[0016] Then, aiming at solution of the trouble mentioned above by establishing a means to change the outgoing radiation include angle of light into the substrate of an organic electroluminescent element is proposed.

[0017] As a conventional organic electroluminescent element, "the organic thin film electroluminescent element used for the light sources, such as a segment and a dot display," is indicated by JP,2773720,B, and the organic thin film electroluminescent element which raises optical ejection effectiveness by forming lens structure in the optical ejection side of a substrate is indicated.

[0018] Moreover, "the organic electroluminescent element excellent in luminous efficiency" is indicated by JP,2991183,B, and the organic electroluminescent element which raised optical ejection effectiveness by forming a diffraction grating etc. in the location which controls the total reflection of a component interface is indicated.

[0019] Moreover, "an organic electroluminescent element" is indicated by JP,9-129375,A and the organic

electroluminescent element which raised optical ejection effectiveness by making a scattered reflection side, or reflection and angle of refraction produce turbulence for an optical ejection side front face is indicated.
[0020] Moreover, "the display unit using an organic electroluminescent element etc." is indicated by JP,10-189251,A, and forming a means to change whenever [light emission elevation], in a transparence substrate is indicated.
[0021] Moreover, "the organic electroluminescent element luminescence equipment used suitable for the display device of a noncommercial use and industrial use and a color display" is indicated by JP,10-308286,A, and the organic electroluminescent element which raises optical ejection effectiveness is indicated by forming a light reflex layer in a lower electrode side face.
[0022]
[Problem(s) to be Solved by the Invention] However, in the above-mentioned conventional organic electroluminescent element, it had the following technical problems.
[0023] (1) Since mesa structure had the reverse V typeface structure in the component side of a substrate side when using for image formation equipments, such as a display, forming an electrode, with the effectiveness of mesa structure held had the technical problem were difficult.
[0024] (2) When using for the image formation equipment by the active-matrix method, forming a drive circuit, with the effectiveness of mesa structure held had the technical problem were very difficult.
[0025] (3) When mesa structure was formed on a substrate, since luminescence from an organic electroluminescent element would penetrate both mesa structure and a substrate at least and would be taken out into air, it will lose the part and light which go via a substrate, and had the technical problem that luminous efficiency worsened.
[0026] (4) When the organic electroluminescent element which formed mesa structure on said substrate as image formation equipments, such as a display, is used, Since the light emitted from the pixel of arbitration penetrates both mesa structure and a substrate at least and is taken out into air, The light which carries out total reflection caused [which reaches another pixel via a substrate and is emitted into air from the pixel] the so-called stray light, and had the technical problem that faults, such as a fall of contrast, were brought about.
[0027] (5) When mesa structure and an organic electroluminescent element were formed separately, the alignment at the time of lamination had the technical problem that it was difficult and degradation of vision properties, such as moire by gap of lamination, arose. Moreover, it had the technical problem that it was easy to produce faults, such as peeling by stress.
[0028] Offer of the image formation equipment which can maintain the efficient luminescence engine performance which solves the above-mentioned conventional technical problem and was excellent in offer of the organic electroluminescent element which can maintain the efficient luminescence engine performance excellent in visibility, and visibility, and weight of this invention are light, and it aims at offering the long personal digital assistant of a time.
[0029]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the organic electroluminescent element of this invention is an organic electroluminescent element equipped with the anode plate which pours in an electron hole at least on a substrate, the luminous layer which has a luminescence field, and the cathode which pours in an electron, and the light emitted from said luminous layer is taken out from a substrate and the field which counters, and consists of a configuration that the reverse V typeface structure higher than a luminous layer is formed in a part of component forming face [at least] of said substrate.
[0030] The organic electroluminescent element which can maintain the efficient luminescence engine performance excellent in visibility by this configuration can be offered.
[0031] Moreover, the anode plate where the image formation equipment of this invention pours in an electron hole at least on a substrate, It is the organic electroluminescent element equipped with the luminous layer which has a luminescence field, and the cathode which pours in an electron. Said anode plate and said cathode of the organic electroluminescent element by which the light emitted from said luminous layer is taken out from a substrate and the field which counters, and the reverse V typeface structure higher than a luminous layer is formed in a part of component forming face [at least] of said substrate It separates into an individual electrical-and-electric-equipment target in the shape of a stripe, is constituted, and has the image display array which consists of two or more pixels, and the direction of in the substrate side of said reverse V typeface structure and the direction of the pixel formed with a stripe electrode consist of the same configuration.

[0032] By this configuration, offer of the image formation equipment which can maintain the efficient luminescence engine performance which was excellent in visibility can be offered.
[0033] Moreover, the anode plate where the image formation equipment of this invention pours in an electron hole at least on a substrate, It is the organic electroluminescent element equipped with the luminous layer which has a luminescence field, and the cathode which pours in an electron. Said anode plate or said cathode of the organic electroluminescent element by which the light emitted from said luminous layer is taken out from a substrate and the field which counters, and the reverse V typeface structure higher than a luminous layer is formed in a part of component forming face [at least] of said substrate It is dissociated and constituted by the individual electrical-and-electric-equipment target for every pixel, and it is scanned through at least one or more switching elements, and said anode plate or said cathode has an image display array, and consists of the configuration with same direction of in the substrate side of said reverse V typeface structure and direction of a pixel.
[0034] By this configuration, offer of the image formation equipment which can maintain the efficient luminescence engine performance which was excellent in visibility can be offered.
[0035] Moreover, the anode plate where the personal digital assistant of this invention pours in an electron hole at least on a substrate, It is the organic electroluminescent element equipped with the luminous layer which has a luminescence field, and the cathode which pours in an electron. Said anode plate and said cathode of the organic electroluminescent element by which the light emitted from said luminous layer is taken out from a substrate and the field which counters, and the reverse V typeface structure higher than a luminous layer is formed in a part of component forming face [at least] of said substrate It separates into an individual electrical-and-electric-equipment target in the shape of a stripe, is constituted, and has the image display array which consists of two or more pixels. The direction of in the substrate side of said reverse V typeface structure, The image formation equipment with the same direction of the pixel formed with a stripe electrode, It is dissociated and constituted by the individual electrical-and-electric-equipment target for every pixel. Or said separated electrode By being scanned through at least one or more switching elements A sound signal conversion means to have an image display array and for the direction of in the substrate side of said reverse V typeface structure and the direction of a pixel to have consisted of same image formation equipment and to be a personal digital assistant and to change voice into a sound signal, An actuation means to input the telephone number etc., and a display means to display an arrival-of-the-mail display, the telephone number, etc., It consists of a configuration equipped with the means of communications which changes a sound signal into a sending signal, a receiving means to change an input signal into a sound signal, the antenna which transmit and receive said sending signal and said input signal, and the control means which controls each part.
[0036] By this configuration, weight is light and a time can offer a long personal digital assistant.
[0037]
[Embodiment of the Invention] In order to attain this purpose, the organic electroluminescent element of this invention according to claim 1 The anode plate which pours in an electron hole at least on a substrate, and the luminous layer which has a luminescence field, It is the organic electroluminescent element equipped with the cathode which pours in an electron, and the light emitted from a luminous layer is taken out from a substrate and the field which counters, and is taken as the configuration in which the reverse V typeface structure higher than a luminous layer is formed in a part of component forming face [at least] of a substrate.
[0038] The following operations are acquired by this configuration.
[0039] (1) Since the reverse V typeface structure higher than a luminous layer is formed in a part of component forming face [at least] of a substrate, the light emitted into air from opening reaches the reverse V typeface structure, the brightness of the direction of a transverse plane improves and effectual component effectiveness goes up by the orientation of light changing.
[0040] (2) Since both the light directly emitted from a component and the light emitted by reflecting by the reverse V typeface structure are visible when a component is seen from a transverse plane, the luminescence area of the appearance of a component becomes large.
[0041] Here, as a substrate, in order not to use as an ejection side of light, transparence or opacity, and any substrate can be used and there should just be reinforcement which can hold an organic electroluminescent element.
[0042] As an ingredient of a substrate, transparence or translucent soda lime glass, barium strontium content glass, Inorganic glass, such as inorganic oxide glass, such as lead glass, aluminosilicate glass, borosilicate glass, barium borosilicate glass, and quartz glass, and inorganic fluoride glass, Or transparence or

translucent polyethylene terephthalate, a polycarbonate, Pori polymethylmethacrylate, polyether sulfone, vinyl fluoride High polymer films, such as polypropylene, polyethylene, polyacrylate, amorphous polyolefine, and fluororesin etc., or cull KOGENO of transparence or As2S3 [translucent], As40S10, and S40germanium10 grade -- the id -- glass -- Ingredients, such as a metallic oxide of ZnO, Nb 2O5, Ta2O5, SiO, Si3N4, HfO2, and TiO2 grade, and a nitride, Or semiconductor materials, such as opaque silicon, germanium, carbonization silicon, gallium arsenide, and gallium nitride, Or it can choose from the transparence substrate ingredient containing a pigment etc., the metallic material which performed insulating processing to the front face suitably, and can use, and the laminated circuit board which carried out the laminating of two or more substrate ingredients can also be used. Moreover, the circuit which consists of resistance, a capacitor inductor diode transistor, etc. for driving an organic electroluminescent element may be formed in the interior of this substrate front face or a substrate.

[0043] An anode plate is an electrode which pours in an electron hole, and it is required to inject an electron hole into a luminous layer or an electron hole transportation layer efficiently.

[0044] A transparent electrode can be used as an anode plate. As an ingredient of a transparent electrode, metallic oxides, such as an indium stannic-acid ghost (ITO), tin oxide (SnO2), and a zinc oxide (ZnO), Or the transparence electric conduction film which consists of mixture, such as SnO:Sb (antimony) and ZnO:aluminum (aluminum), or metal thin films, such as a metal thin film called aluminum (aluminum), Cu (copper), Ti (titanium), and Ag (silver) of the thickness of extent which does not spoil transparency, a mixed thin film of these metals, and a laminating thin film, -- or conductive polymers, such as polypyrrole, etc. can be used. Moreover, it can also consider as a transparent electrode by carrying out the laminating of two or more above-mentioned transparent electrode ingredients, and forms by various kinds of polymerization methods, such as resistance heating vacuum evaporationo, electron beam evaporation, a spatter, or an electric-field polymerization method, etc. Moreover, in order to give sufficient conductivity, or in order to prevent ununiformity luminescence by the irregularity on the front face of a substrate, as for a transparent electrode, it is desirable to make it the thickness of 1nm or more. Moreover, in order to give sufficient transparency, it is desirable to make it the thickness of 500nm or less.

[0045] Furthermore, as an anode plate, the big metal of work functions, such as Cr (chromium), nickel (nickel), Cu (copper), Sn (tin), W (tungsten), and Au(gold), or its alloy, an oxide, etc. can be used besides a transparent electrode, and the laminated structure by two or more ingredients which used these anode materials can also be used. However, when not using a transparent electrode as an anode plate, in order to make the most of the effectiveness of the include-angle conversion means of light, as for an anode plate, forming with the ingredient which reflects light is desirable. In addition, cathode should just be a transparent electrode when not using a transparent electrode as an anode plate.

[0046] Moreover, the amorphous carbon film may be prepared in an anode plate. In this case, it both has a function as a hole-injection electrode. That is, an electron hole is injected into a luminous layer or an electron hole transportation layer through the amorphous carbon film from an anode plate. Moreover, a spatter comes to form the amorphous carbon film between an anode plate, a luminous layer, or an electron hole transportation layer. Although there are isotropic graphite, anisotropy graphite, glassy carbon, etc. and it does not limit especially as a carbon target by sputtering, isotropic graphite with high purity is suitable. If the point that the amorphous carbon film is excellent is shown concretely, when the work function of the amorphous carbon film will be measured using Riken Keiki 1 [surface analysis equipment AC-], the work function of the amorphous carbon film is Wc=5.40eV. Here, since the work function of ITO generally well used as an anode plate is WITO=5.05eV, it can pour in an electron hole having used the amorphous carbon film efficiently [direction] in a luminous layer or an electron hole transportation layer. Moreover, in case the amorphous carbon film is formed by the sputtering method, in order to control the electric resistance value of the amorphous carbon film, reactive sputtering is carried out under the mixed-gas ambient atmosphere of nitrogen or hydrogen, and an argon. Furthermore, in the thin film coating technology by the sputtering method etc., if thickness is set to 5nm or less, the film will serve as island-shape structure and the homogeneous film will not be obtained. Therefore, by 5nm or less, efficient luminescence is not obtained for the thickness of the amorphous carbon film, and effectiveness of the amorphous carbon film cannot be expected. When thickness of the amorphous carbon film is set to 200nm or more, a membranous color wears a blacking wash and luminescence of an organic electroluminescent element stops moreover, fully penetrating.

[0047] What has a fluorescence property in a visible region, and consists of a good fluorescent substance of membrane formation nature as a luminous layer here is desirable. Besides Alq3 or Be-benzoquinolinol (BeBq2), it is 2 and 5-screw (5, 7-G t-pentyl-2-benzoxazolyl). - 1, 3, 4-thiadiazole, A 4 and 4'-bis(5, 7-Ben

Chill-2-benzoxazolyl) stilbene, 4 and 4' bis[-] [5 and 7-G (2-methyl-2-butyl)-2-benzoxazolyl] stilbene, 2, a 5-bis(5, 7-G t-Ben Chill-2-benzoxazolyl) thio fin, 2, a 5-bis([5-alpha and alpha-dimethylbenzyl]-2-benzoxazolyl) thiophene, 2, 5-screw [5 and 7-G (2-methyl-2-butyl)-2-benzoxazolyl]-3, 4-diphenyl thiophene, 2, a 5-bis(5-methyl-2-benzoxazolyl) thiophene, A 4 and 4'-bis(2-benzoOKISAIZORIRU) biphenyl, 5-methyl-2-[2-[4-(5-methyl-2-benzoOKISAIZORIRU) phenyl] vinyl] benzoOKISAIZORIRU, Benzooxazole systems, such as 2-[2-(4-chlorophenyl) vinyl] [1 and 2-naphth d] oxazole, 2 2' -(p-phenylenedivinylene)- Benzothiazole systems, such as screw benzothiazole, 2-[2-[4-(2-benzoimidazolyl) phenyl] vinyl] benzimidazole, Fluorescent brighteners, such as benzimidazole systems, such as 2-[2-(4-carboxyphenyl) vinyl] benzimidazole, Bis(eight quinolinol) magnesium, bis(benzo-eight quinolinol) zinc, Bis(2-methyl-8-quinolate) aluminum oxide, a tris (eight quinolinol) indium, Tris (5-methyl-eight quinolinol) aluminum, an eight-quinolinol lithium, A tris (5-chloro-eight quinolinol) gallium, bis(5-chloro-eight quinolinol) calcium, Metal chelation oxy-NOIDO compounds, such as 8-hydroxyquinoline system metal complexes, such as Pori [zinc-bis(8-hydroxy-5-KINORI nonyl) methane], and dilithium EPINDORI dione, 1, 4-bis(2-methyl styryl) benzene, 1, 4-(3-methyl styryl) benzene, 1, 4-bis(4-methyl styryl) benzene, JISUCHIRIRU benzene, 1, 4-bis(2-ethyl styryl) benzene, 1, 4-bis(3-ethyl styryl) benzene, Styryl benzenoid compounds, such as 1 and 4-bis(2-methyl styryl) 2-methylbenzene, 2, 5-bis(4-methyl styryl) pyrazine, 2, 5-bis(4-ethyl styryl) pyrazine, 2 and 5-bis[2-(1-naphthyl) vinyl] pyrazine, 2, 5-bis(4-methoxy styryl) pyrazine, JISUCHIRU pyrazine derivatives, such as 2 and 5-bis[2-(4-biphenyl) vinyl] pyrazine, 2, and 5-bis[2-(1-pyrenyl) vinyl] pyrazine, The North America Free Trade Agreement RUIMIDO derivative, a perylene derivative, an OKISA diazole derivative, an aldazine derivative, a cyclopentadiene derivative, a styryl amine derivative, a coumarin system derivative, an aromatic series JIMECHIRI DIN derivative, etc. are used. Furthermore, an anthracene, salicylate, a pyrene, coronene, etc. are used. Or phosphorescence luminescent material, such as FAKU-tris (2-phenyl pyridine) iridium, may be used.

[0048] Moreover, which structure of the two-layer structure of an electron hole transportation layer, a luminous layer or a luminous layer, and an electronic transportation layer and the three-tiered structure of an electron hole transportation layer, a luminous layer, and an electronic transportation layer is sufficient besides the monolayer structure of only a luminous layer. however -- the case of such a two-layer structure or a three-tiered structure -- an electron hole transportation layer and an anode plate -- or a laminating is carried out and it is formed so that cathode may touch an electronic transportation layer.

[0049] Here, as cathode, it is the electrode which pours in an electron, and it is required to inject an electron into a luminous layer or an electronic transportation layer efficiently, and, generally the oxide of metals, such as aluminum (aluminum), In (indium), Mg (magnesium), Ti (titanium), Ag (silver), calcium (calcium), Sr (strontium), etc. with a small work function, or these metals, a fluoride and its alloy, a layered product, etc. are used. In order to make the most of the effectiveness of the include-angle conversion means of light, as for cathode, forming with the ingredient which reflects light is desirable. When the include-angle conversion means of light is formed, it is difficult to perform effective include-angle conversion to all light, therefore total reflection of the light which was not taken out by include-angle conversion of a one-time light is carried out by the interface with air, it is again spread inside a component, and reaches to cathode. Or in a luminous layer, since light is emitted isotropic, one half reaches to cathode among the light emitted by the luminous layer, before arriving at an optical ejection side. When formed with the ingredient with which cathode reflects light at this time, it is reflected, and again, the light which reached to this cathode can be spread in the direction of an optical drawing side, and may be used as an effective light. In order to confirm this effectiveness, as for cathode, forming with the ingredient which reflects light is desirable, and it is still more desirable that the reflection factor of light is 50% or more. Since the rate of the improvement in effectiveness by include-angle conversion of light is about 2 times, this can perform effective optical drawing, if the loss of light [in / in the reflection factor of light / 50% or more, i.e., cathode,] is 50% or less. Although it was required in the conventional organic electroluminescent element that the reflection factor of cathode should have been very high, when optical ejection effectiveness improves, selectivity, such as an ingredient of cathode, thickness, and the formation approach, is also expandable. In addition, the above thing is applied to an anode plate, when cathode is used as a transparent electrode.

[0050] Moreover, as cathode, the high super-thin film of the light transmission nature which used the small metal of a work function for the interface which touches a luminous layer or an electronic transportation layer is formed, it is carrying out the laminating of the transparent electrode in the upper part, and transparence cathode can also be formed. Laminated structures, such as LiO2/aluminum, such as small Mg of especially a work function, a Mg-Ag alloy, an aluminum-Li alloy given in JP,5-121172,A and a Sr-Mg alloy or an aluminum-Sr alloy, and an aluminum-Ba alloy, or LiF/aluminum, are suitable as a cathode

material.
[0051] Furthermore, as the membrane formation approach of these cathode, resistance heating vacuum evaporationo, electron beam evaporation, and a spatter are used.
[0052] In addition, at least one side of an anode plate and cathode should just be a transparent electrode. Furthermore, although you may be both transparent electrodes, if one side is a transparent electrode in order to raise the ejection effectiveness of light, it is desirable that another side forms with the ingredient which reflects light.
[0053] As the reverse V typeface structure, any of two structures, a reflective mold or a transparency mold, can be used.
[0054] Moreover, the reverse V typeface structure is the structure which the cross-section configuration becomes from two fields arranged so that it may become convex to a component forming face.
[0055] Here as an ingredient of the reverse V typeface structure of a reflective mold aluminum (aluminum), Ag (silver), Au(gold) using metallic reflection, Pt (platinum), Cu (copper), Li (lithium), Cr (chromium), Ti (titanium), Fe (iron), germanium (germanium), In (indium), Mg (magnesium), Ba (barium), nickel (nickel), Si (silicon), Sn (tin), W (tungsten), Zn (zinc), Mo (molybdenum), Ta (tantalum), etc., The metallic reflection ingredient using metallic reflection called the layered product which comes to carry out the laminating of one or more kinds of a metal, alloys, or these film, Or the resin using the light reflex of the conductive resin which can do conductive particles, such as metal powder, by distributing resin at least etc., Or from ****** using white reflection of the white resin made into conductive resin by distributing white pigments etc., it can choose suitably, and can use, or the reflective mold reverse V typeface structure can form reflective die materials in the front face of the ingredient of arbitration.
[0056] Moreover, as an ingredient of the reverse V typeface structure of a transparency mold, it can choose from the ingredient of transparence or a translucent substrate suitably, and can use, or hardening mold resin, such as a transparence resist, etc. can be used. However, the refractive index of the ingredient used for the transparency mold structure must choose an ingredient smaller than the refractive index of a transparence flattening ingredient.
[0057] As an electron hole transportation layer, hole mobility is high, it is transparent and the good thing of membrane formation nature is desirable. Besides TPD, porphin, tetraphenylporphine copper, a phthalocyanine, Porphyrin compounds, such as a copper phthalocyanine and titanium phthalocyanine oxide, A 1 and 1-bis{4-(G P-tolylamino) phenyl} cyclohexane, 4, 4', a 4"-trimethyl triphenylamine, N and N, N', N'-tetrakis (P-tolyl)-P-phenylenediamine, 1-(N and N-G P-tolylamino) naphthalene, 4, a 4 'bis[- / -2-2] (dimethylamino)'-dimethyl triphenylmethane color, N, N, N', and N' -- the - tetra-phenyl -4 and 4' - diamino biphenyl -- N, N'-diphenyl-N, the N'-G m-tolyl -4, N, N-diphenyl-N, the N'-screw (3-methylphenyl) -1, 1' - 4 4'-diamine, Aromatic series tertiary amines, such as a 4'-diamino biphenyl and N-phenyl carbazole, Stilbene compounds, such as a 4-G P-tolylamino stilbene and 4-(G P-tolylamino)-4'-[4-(G P-tolylamino) styryl] stilbene, A triazole derivative, an OKISAJIZAZORU derivative, and an imidazole derivative, The poly aryl alkane derivative, a pyrazoline derivative, and a pyrazolone derivative, A phenylenediamine derivative, an annealing amine derivative, and an amino permutation chalcone derivative, an oxazole derivative, a styryl anthracene derivative, and full -- me -- non -- a derivative -- A hydrazone derivative, a silazane derivative, a polysilane system aniline system copolymer, giant-molecule oligomer, a styryl amine compound, an aromatic series JIMECHIRI DIN system compound, and organic materials, such as Pori 3-methylthiophene, are used. Moreover, the electron hole transportation layer of the macromolecule dispersed system which distributed the organic material for low-molecular electron hole transportation layers is also used into macromolecules, such as a polycarbonate.
[0058] Moreover, as an electronic transportation layer, OKISA diazole derivatives, such as 1 and 3-bis(4-tert-buthylphenyl - 1, 3, 4-oxadiazolyl) phenylene (OXD-7), an anthra quinodimethan derivative, a diphenyl quinone derivative, etc. are used.
[0059] The transparency of extent which does not bar the transparence of the ingredient which constitutes the organic electroluminescent element in this invention here, or a check by looking of luminescence according being translucent to an organic electroluminescent element is shown.
[0060] Invention according to claim 2 is an organic electroluminescent element component according to claim 1, and considers the optical ejection side of an organic electroluminescent element as the configuration in which flattening is carried out by the transparence flattening structure formed with the transparent ingredient.
[0061] In addition to an operation of claim 1, the following operations are acquired by this configuration.
[0062] (1) The orientation and ejection effectiveness of light improve by making into a flat surface the

concave heights formed of the reverse V typeface structure by the transparence flattening structure formed with the transparent ingredient.
[0063] (2) Since the stacking tendency of light becomes good and the brightness of the direction of a transverse plane improves, effectual component effectiveness increases very much.
[0064] (3) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0065] (4) By making a component front face flat, the reinforcement of a component improves and there is effectiveness of dust being unable to adhere easily.
[0066] (5) Since flattening structure is thin enough, it is hard to produce a blot of light etc.
[0067] Here, the transparence flattening structure carries out flattening of the concavo-convex structure formed of the reverse V typeface structure, slushes the transparent ingredient which has a fluidity between the reverse V typeface structures, is made to harden it with means, such as ultraviolet rays, heat, and cooling, and is formed. As this approach, an ingredient with fluidities, such as optical adhesives and a resist, is applied to a component front face, flattening is carried out using a suitable spacer, a suitable squeegee, etc., and the approach hardened is used suitably.
[0068] Moreover, as an ingredient of the transparence flattening structure, optical adhesives, such as transparence or the translucent ingredient of a substrate and a translucent transparence resist ingredient, an ultraviolet curing mold, and a heat-curing mold, or the transparent material which compounded them can be used.
[0069] Here, the relation of the refractive index of the optical refraction angle in the interface of a different medium and a medium follows a Snell's law. Therefore, in the organic electroluminescent element by which a light emission is carried out isotropic, the light emitted at a bigger include angle than a critical angle repeats the total reflection in an interface, is confined in the interior of a component, and is no longer emitted into air. Therefore, it is an important technical problem in improvement in the effectiveness of an organic electroluminescent element to change the include angle and amount of the light which changes the include angle of the light which reaches an optical ejection side / air interface, and is emitted into air by changing the include angle of light using the means in which the light in an interface carries out include-angle conversion. Although structures, such as lens structure, mesa structure, prism structure, etc. on a substrate, are proposed about the include-angle conversion means of this light, especially the mesa mold structure is the means of the effective improvement in optical ejection effectiveness also in these by the reasons that the effectiveness over the improvement in ejection effectiveness of light is large, nil why the effectiveness over the improvement in brightness of the direction of a transverse plane is large, etc. However, since the constraint to the ingredient and the formation approach used for the structure, the constraint to the formation approach of an organic electroluminescent element, etc. arise when forming such structures on a substrate, formation is difficult. When using for the image formation equipment especially by the active-matrix method, it is very difficult to form a drive circuit, with the effectiveness of mesa structure held.
[0070] Here, mesa structure is the structure which cut off the upper part of a pyramid, and it can be written also as a truncated four-sided pyramid and a truncated cone. Here, the truncated four-sided pyramid is expressed as the mesa.
[0071] Then, based on the lamination of the organic electroluminescent element shown in drawing 1 , when the refractive index of the transparence flattening structure was changed, optical simulation about the ejection effectiveness of the light of an about was performed.
[0072] The result of this optical simulation is shown in drawing 2 . In addition, drawing 2 is a graph which shows the result of optical simulation, and the relative value to the ejection effectiveness of the light in a monotonous substrate without mesa structure has shown it in the ejection effectiveness of the light at the time of changing the refractive index of the transparence flattening structure.
[0073] Here, the conditions of optical simulation are explained concretely. the refractive index of each class -- luminous layer = -- 1.7, ITO=2.0, substrate =1.5, and air =1.0 -- carrying out -- moreover, the thickness of each class -- luminous layer =150nm, ITO=150nm, and substrate =1mm -- reverse -- it is V typeface structure =100micrometer, and the include angle of the taper angle of the reverse V typeface structure, i.e., the vertical-angle part of the reverse V typeface structure, was made into 40 degrees. In addition, it shall be altogether reflected by the interface of a luminous layer and cathode, and the light from a luminous layer took into consideration only the absorption in a luminous layer, ITO, and a substrate. That is, the permeability of cathode of 100% of reflection factors, a luminous layer, ITO, a substrate, and the transparence flattening structure is 80%, 97%, 97%, and 97%, respectively. Here, simulation was performed

as transparence flattening structure =1.3, and 1.5, 1.7 and 1.9.
[0074] In the above conditions, it turns out in drawing 2 that the value of the ejection effectiveness when changing the refractive index of the transparence flattening structure is calculated, take out as a refractive index becomes large, and the value of effectiveness becomes large, the value of a refractive index has point of inflection in the 1.7 neighborhoods, and the rate of improvement of ejection effectiveness falls. If the ejection effectiveness of light has the refractive index of the transparence flattening structure larger than the above count result, in order to improve, it is desirable still more desirable that it is 1.4-2.5, and the refractive indexes of the transparence flattening structure are 1.7-1.9.
[0075] Invention according to claim 3 is an organic electroluminescent element according to claim 1 or 2, and the reverse V typeface structure is taken as the configuration which reflects light.
[0076] In addition to claim 1 or an operation of 2, the following operations are acquired by this configuration.
[0077] (1) Since the reverse V typeface structure forms mesa mold structure and it is formed with the ingredient which reflects light, it is reflected efficiently and the ejection effectiveness and transverse-plane brightness of light of light improve.
[0078] (2) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0079] (3) Like [in the case of transparence], since it is not necessary to take a refractive index into consideration, the degree of freedom of ingredient selection tends to raise effectiveness to lightweight-ization etc. highly.
[0080] Here, as an ingredient of the reverse V typeface structure which reflects light, the ingredient of the reverse V typeface structure of the reflective mold mentioned above can be used. Moreover, forming by the medium of arbitration is possible. Therefore, it is also possible to arrange wiring and a circuit inside V typeface structure.
[0081] invention according to claim 4 -- an organic electroluminescent element according to claim 2 -- it is -- the reverse V typeface structure -- the transparence flattening structure -- low -- it considers as the configuration currently formed with the refractive index ingredient.
[0082] In addition to an operation of claim 2, the following operations are acquired by this configuration.
[0083] (1) the reverse V typeface structure -- the transparence flattening structure -- low -- since it is formed with the refractive index ingredient, total reflection of the light is carried out on the side face of mesa structure, and the ejection effectiveness and the transverse-plane brightness of light improve.
[0084] (2) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0085] (3) Like a reflector, since it is not reflection by surface reflection, a reflective loss is small.
[0086] (4) By designing a refractive index, it is possible to reduce the effect of the stray light.
[0087] (5) Since it is transparence, it is possible to form not only in the periphery of a pixel but in the interior of a pixel.
[0088] Invention according to claim 5 is claim 2 thru/or an organic electroluminescent element given in the inside 1 [any] of 4, and the transparence flattening structure is taken as the configuration currently formed on the protective coat formed in the organic electroluminescent element front face.
[0089] In addition to an operation of any one, by this configuration, the following operations are acquired among claim 2 thru/or 4.
[0090] (1) Since a protective coat is formed and the transparence flattening film is formed in the top face, organic electroluminescence can be manufactured, without giving damages, such as heat and stress, to a transparent electrode and a lower organic layer.
[0091] (2) The formation approach and formation ingredient which are formed on a protective coat can be chosen freely.
[0092] (3) Since the protective coat is formed, an organic electroluminescent element can be intercepted from the open air, and excel in long duration stability.
[0093] Here, the polymeric materials of a silane system with the resin of the glass membrane which consists of those mixture, such as a thin film which consists of inorganic oxides, such as SiON, SiO, SiN and SiO2, aluminum2O3, and LiF, an inorganic nitride, and an inorganic fluoride or an inorganic oxide, an inorganic nitride, and an inorganic fluoride, etc. as an ingredient of a protective coat or thermosetting, and a photoresist, or the closure effectiveness etc. are mentioned, and it is formed by the applying or method such as vacuum evaporationo and sputtering,.
[0094] Invention according to claim 6 is claim 1 thru/or an organic electroluminescent element given in the

inside 1 [any] of 5, and the reverse V typeface structure is taken as the configuration currently formed in bilateral symmetry.
[0095] In addition to an operation of any one, by this configuration, the following operations are acquired among claim 1 thru/or 5.
[0096] (1) Since the reverse V typeface structure is formed in the configuration symmetrical [concavo-convex structure], directivity strong against the direction of a transverse plane can be given for the orientation of light.
[0097] (2) Since the directivity of light can be controlled and the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0098] (3) Since how when leaning in a longitudinal direction and the vertical direction to be visible is the same, there is no fault, like an eye gets tired and excel in visibility.
[0099] (4) Don't need a complicated optical design and creation of the structure is also easy.
[0100] Invention according to claim 7 is claim 1 thru/or an organic electroluminescent element given in the inside 1 [any] of 5, and the reverse V typeface structure is taken as the configuration currently formed in right-and-left asymmetry.
[0101] In addition to an operation of any one, the following operations are acquired among claim 1 thru/or 5 by this configuration.
[0102] (1) the reverse V typeface structure -- concavo-convex structure -- right and left -- since it is formed in the unsymmetrical configuration, the direction of orientation of light is changed -- it can make -- concavo-convex structure -- right and left -- light can be made to emit isotropic by arranging asymmetrically and at random
[0103] (2) Since the effect to outdoor daylight can be reduced and the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0104] (3) By designing the inclination of a V in all typeface slot in area, it is possible to give special vision properties, such as to sense brighter than actual luminescence.
[0105] (4) Since you may shift somewhat, creation is easy and the yield also becomes high.
[0106] Invention according to claim 8 is claim 1 thru/or an organic electroluminescent element given in the inside 1 [any] of 7, and the reverse V typeface structure is taken as the configuration currently formed in the shape of [the cross-section configuration of whose is two of V typefaces] a straight line.
[0107] In addition to an operation of any one, by this configuration, the following operations are acquired among claim 1 thru/or 7.
[0108] (1) since the reverse V typeface structure is formed in the shape of a straight line -- a design and formation of structure -- ** -- it can do easily.
[0109] (2) Since the reverse V typeface structure is linear mesa structure, the ejection effectiveness of light improves.
[0110] (3) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0111] Here, even if the top-most-vertices parts of the reverse V typeface structure are field configurations, such as a flat surface or a curved surface, in the effectiveness about optical ejection, effect is small, and it is satisfactory practically.
[0112] Invention according to claim 9 is claim 1 thru/or an organic electroluminescent element given in the inside 1 [any] of 7, and the reverse V typeface structure is taken as the configuration in which the cross-section configuration is formed in the inside of reverse V typefaces in the shape of [****] a curve.
[0113] In addition to an operation of any one, by this configuration, the following operations are acquired among claim 1 thru/or 7.
[0114] (1) Since the cross-section configuration of the reverse V typeface structure is formed in the **** rounded configuration inside, it can form easily.
[0115] (2) Since the cross-section configuration of the reverse V typeface structure is the rounded mesa structure where it is **** inside, according to the include angle of the light which arrives at a side face, light can be taken out efficiently.
[0116] (3) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0117] Here, even if the top-most-vertices parts of the reverse V typeface structure are field configurations, such as a flat surface or a curved surface, in the effectiveness about the optical ejection mentioned above, effect is small, and it is satisfactory practically.
[0118] The anode plate and cathode of claim 1 thru/or an organic electroluminescent element given in the

inside 1 [any] of 9 are separated and constituted by the individual electrical-and-electric-equipment target in the shape of a stripe, and image formation equipment according to claim 10 has the image display array which it becomes from two or more pixels, and considers that the direction of in the substrate side of the reverse V typeface structure and the direction of the pixel formed with a stripe electrode are the same as the configuration which it had.
[0119] The following operations are acquired by this configuration.
[0120] (1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance can be maintained and good lighting in a simple matrix method can be performed.
[0121] (2) The reverse V typeface structure can be arranged to a part for plow Mabe of a matrix-like electrode, and it is possible to raise luminous efficiency effectively.
[0122] Here, when using an organic electroluminescent element as lighting systems, such as image formation equipments, such as a display, or the printer light source, the design about the above-mentioned orientation of light becomes important. for example, the case where it uses as a display of a personal digital assistant or a cash dispenser -- the display condition -- a user -- since it is called for that a light strong only against the part of the photo conductor corresponding to opening can be irradiated when using as the printer light source, it is [that only he recognizes / that there should just be brightness from opening to the direction of a transverse plane] desirable [the visibility from a perimeter / the lower one is desirable, or] that there are few light emissions to the direction of the circumference. When above, the thing strong against the ****** direction of the light emitted from opening weakly emitted in the direction of a perimeter is desirable, and it is desirable that directive optical high ejection is made.
[0123] Image formation equipment according to claim 11 the anode plate or cathode of claim 1 thru/or an organic electroluminescent element given in the inside 1 [any] of 9 Dissociated and constituted by the individual electrical-and-electric-equipment target for every pixel, it is scanned through at least one or more switching elements, and an anode plate or cathode has an image display array, and considers that the direction of in the substrate side of the reverse V typeface structure and the direction of a pixel are the same as the configuration which it had.
[0124] The following operations are acquired by this configuration.
[0125] (1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance can be maintained and good lighting in an active-matrix method can be performed.
[0126] (2) The reverse V typeface structure can be arranged into the crevice between each pixel, and parts, such as the switching element upper part, and it is possible to raise luminous efficiency effectively.
[0127] Moreover, when preparing mesa structure in image formation equipments, such as a display, it is important to use effectively the light emitted from a pixel, and if the direction which is a pixel, and the direction of the reverse V typeface structure are in agreement, they can arrange the reverse V typeface structure, without decreasing the light-emitting part in a pixel, and can perform the include-angle conversion effectiveness of an efficient light.
[0128] Invention according to claim 12 is image formation equipment according to claim 10 or 11, and the core of the reverse V typeface structure that the pitch of each direction of the reverse V typeface structure spreads the pitch of each direction of the light-emitting part corresponding to each pixel, abbreviation, etc. is considered as the configuration in the abbreviation midpoint which connects the core of each pixel.
[0129] In addition to claim 10 or an operation of 11, the following operations are acquired by this configuration.
[0130] (1) By making the same the pitch of the reverse V typeface structure, and the pitch of a pixel, physical relationship of a light-emitting part and the reverse V typeface structure can be made the same, the same improvement effectiveness in ejection effectiveness is acquired in every pixel, and a good image can be obtained.
[0131] (2) Since opening in a pixel can be arranged effectively and the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0132] Invention according to claim 13 is image formation equipment according to claim 10 or 11, and considers the height of the transparence flattening structure as a configuration lower than the sum of the height of the reverse V typeface structure, and the width of face of the direction of a flat surface of a pixel.
[0133] In addition to claim 10 or an operation of 11, the following operations are acquired by this configuration.
[0134] (1) If the height of the transparence flattening structure is made below into the sum of the height of the reverse V typeface structure, and the width of face of the direction of a flat surface of a pixel, since effect of the stray light can be made small, faults, such as a fall of contrast, and an optical blot, dotage, do

not happen.
[0135] (2) Since the light which advances into other pixels can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0136] When using the organic electroluminescent element which formed mesa structure on the substrate as image-formation equipments, such as a display, here, in order that the light emitted from the pixel of arbitration reaches another pixel via a substrate, causes [which is emitted into air] the so-called stray light from the pixel and may bring about faults, such as a fall of contrast, and an optical blot, dotage, the fully thin thing of the thickness from mesa structure to an optical ejection side is desirable. It is important especially when using the reverse V typeface structure as a reflective mold.
[0137] A sound signal conversion means for a personal digital assistant according to claim 14 to be a personal digital assistant with which the display means consisted of a claim 10 thru/or image formation equipment given in the inside 1 [any] of 13, and to change voice into a sound signal, An actuation means to input the telephone number etc., and a display means to display an arrival-of-the-mail display, the telephone number, etc., It considers as the configuration equipped with the means of communications which changes a sound signal into a sending signal, a receiving means to change an input signal into a sound signal, the antenna which transmit and receive a sending signal and an input signal, and the control means which controls each part.
[0138] The following operations are acquired by this configuration.
[0139] (1) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance can be maintained and lightweight-izing or the formation of a long time by streamlining of cell capacity etc. can be attained.
[0140] (2) By designing a vision property (orientation of light) suitably, it can use according to an application as a private window hard to see, a window where even two or more persons are legible from a perimeter.
[0141] Here, the organic electroluminescent element of this invention can be used as image formation equipment which displays an image, and these image formation equipment can be used for the display of AV equipments, such as a display of the display of Personal Digital Assistants, such as a cellular phone, and PHS, PDA, television, a personal computer, car navigation, etc., a stereo, and radio, etc.
[0142] Furthermore, it can use for the lighting system as the light source of a laser beam printer, a scanner, etc. Or it can also use as a lighting system as the mere light source like lighting fitting, such as a tonneau light and the right stand.
[0143] It is desirable to use for the lighting system as the light source of the image formation equipment as a display which will display an image in various electronic equipment also in these if a predominance, like ease [the low power of an organic electroluminescent element and the formation of a lightweight thin shape] and a speed of response are quick is taken into consideration, a laser beam printer, a scanner, etc., etc.
[0144] The gestalt of the 1 operation of this invention to the following is explained referring to a drawing.
[0145] (Gestalt 1 of operation) The organic electroluminescent element in the gestalt 1 of operation of this invention is described.
[0146] Drawing 1 is the important section sectional view of the organic electroluminescent element in the gestalt 1 of operation of this invention.
[0147] In drawing 1 , substrates 1 are the electron hole transportation layer by which the anode plates 2 and 3 where 1 was formed on the substrate 1 were formed on the substrate 1, the luminous layer by which 4 was formed on the electron hole transportation layer 3, the cathode where 5 was formed on the luminous layer 4, the reverse V typeface structure by which 6 was formed on the substrate 1, and the transparence flattening structure by which 7 was formed on cathode 5.
[0148] The organic electroluminescent element in the gestalt 1 of operation equips the component side front face of a substrate 1 with the mesa structure which consists of the reverse V typeface structure 6 and the transparence flattening structure 7 as a means of the improvement in ejection effectiveness of light. According to mesa structure, the include angle of the light emitted from a luminous layer is changed into an include angle smaller than the critical angle which causes total reflection in the interface of an optical ejection side and air.
[0149] In addition, the gestalt of this operation may set and the component and the formation approach which it is not restricted to this and mentioned above, and what is conventionally well-known are sufficient as the component and the formation approach of an organic electroluminescent element.
[0150] Furthermore, in the gestalt 1 of operation, although the case of the two-layer structure which consists

of an electron hole transportation layer and a luminous layer was explained, especially about the structure, it is not limited to this as mentioned above.
[0151] Moreover, in the gestalt 1 of operation, although the case of the structure which forms an anode plate in a substrate top face was explained, especially about the structure, it is not limited to this as mentioned above, and cathode may be formed in a substrate top face.
[0152] Moreover, about the gestalt of the closure, as an optical ejection side and a glass cap cannot stick, a glass cap can be formed by pasting up with UV hardening resin etc., or forming and closing a protective coat on the front face of an organic electroluminescent element etc. can adopt a means suitably. Otherwise, you may be the combination of a protective coat, shielding material, etc. Moreover, you may be the structure which forms a protective coat and forms the transparence flattening structure in the top face.
[0153] As mentioned above, according to the gestalt 1 of operation, since light can be taken out efficiently, the efficient luminescence engine performance is maintainable.
[0154] The organic electroluminescent element in the gestalt 1 of operation can be used as a lighting system or image formation equipment.
[0155] (Gestalt 2 of operation) The image formation equipment using the organic electroluminescent element in the gestalt 2 of operation of this invention is described.
[0156] Drawing 3 is the outline perspective view of the image formation equipment using the organic electroluminescent element in the gestalt 2 of operation of this invention.
[0157] drawing 3 -- setting -- 1 -- for electron hole transportation and 4, as for cathode and 6, a luminous layer and 5 are [a substrate 1 / an anode plate and 3 / the reverse V typeface structure and 7] the transparence flattening structures.
[0158] In the gestalt 2 of operation, as shown in drawing 3 , patterning of the anode plate 2 is carried out to the line, and patterning also of the cathode 5 is similarly carried out to this at the line in the form which carries out an abbreviation rectangular cross.
[0159] If direct current voltage or a direct current is impressed to the anode plate 2 and cathode 5 which made the cathode 5 minus-side the anode plate 2 of this image formation equipment plus-side, and were connected and chosen as the drive circuit (driver) as a driving means which is not illustrated, the luminous layer 4 of the part which intersects perpendicularly emits light, and it can be used as image formation equipment of a simple matrix method.
[0160] In the gestalt 2 of operation, it has the mesa structure which becomes the component forming face of a substrate 1 from the reverse V typeface structure 6 and the transparence flattening structure 7 as an include-angle conversion means of light. The mesa structure changes the include angle of the light emitted from a luminous layer 4 into an include angle smaller than the critical angle which causes total reflection in the interface of a high refractive-index substrate and air, and mesa structure is periodically arranged for every pixel.
[0161] In addition, the gestalt of this operation may set and the component and the formation approach which it is not restricted to this and mentioned above, and what is conventionally well-known are sufficient as the component and the formation approach of an organic electroluminescent element.
[0162] As mentioned above, in the image formation equipment of the gestalt 2 of operation, since light can be taken out efficiently, optical ejection effectiveness can improve and the efficient luminescence engine performance can be maintained. Moreover, since the orientation of light becomes strong in the direction of a transverse plane, while being able to control the optical propagation in the light transmission nature substrate in an optical ejection side and being able to maintain the efficient luminescence engine performance, there is no optical blot etc. and visibility becomes good.
[0163] Moreover, in the gestalt 2 of operation, although the image formation equipment of a simple matrix method was explained, the image formation equipment of an active-matrix method may be used, and the same efficient luminescence engine performance as said simple matrix method can be maintained by arranging the reverse V typeface structure 6 in the nonluminescent sections, such as TFT used for a drive among the component forming faces of a substrate.
[0164] In addition, the image formation equipment of the gestalt 2 of operation can be used also as lighting systems, such as the light source of a laser beam printer, a scanner, etc., only as image formation equipment which displays an image. Furthermore, without carrying out patterning to a line, an anode plate 2 and cathode 5 are made to emit light completely, and may be used as a mere lighting system.
[0165] (Gestalt 3 of operation) The personal digital assistant using the organic electroluminescent element of the gestalt 3 of operation of this invention is described.
[0166] Drawing 4 is the perspective view showing the personal digital assistant equipped with the image

formation equipment which used the organic electroluminescent element of this invention, and drawing 5 is the block diagram showing the personal digital assistant equipped with the image formation equipment which used the organic electroluminescent element of this invention.

[0167] The microphone from which 9 changes voice into a sound signal in drawing 4 and drawing 5 , the loudspeaker from which 10 changes a sound signal into voice, The control unit by which 11 is constituted from a dial carbon button etc., and 12 are displays which display arrival of the mail etc., and consist of image formation equipment using the organic electroluminescent element of this invention. The sending signal which is the transmitting section which 13 changes the sound signal from a microphone 9 into an antenna, and changes 14 into a sending signal, and was created in the transmitting section 14 is emitted outside through an antenna 13. 15 is the receive section which changes into a sound signal the input signal which received with the antenna 13, and the sound signal created in the receive section 15 is changed into voice with a loudspeaker 10. 16 is a control section which controls the transmitting section 14, a receive section 15, a control unit 11, and a display 12.

[0168] The voice at the time of a message of a user (addresser) etc. is inputted, from a loudspeaker 10, the voice and the notice sound of the other party are outputted and a microphone 9 is transmitted to a user (addressee). In addition, as a personal digital assistant, when using a pager, it is not necessary to form especially a microphone.

[0169] Furthermore, the control unit 11 is equipped with the ten key and various kinds of function keys as a dial carbon button. Moreover, you may have the ten key, the not only various kinds of function keys but letter key, etc. From this control unit 11, predetermined data, such as a setup of the telephone number, a name, time of day, and various functions, E mail address, and URL, are inputted. Furthermore, not only the actuation by such keyboard but a pen input unit, an audio input unit, the MAG, or an optical input unit may be used for a control unit 11.

[0170] Data or character icons, such as the telephone number memorized by predetermined data and the memory into which a display 12 is inputted from a control unit 11, E mail address, and URL, etc. are displayed.

[0171] Moreover, an antenna 13 performs at least one side of transmission of an electric wave, or reception. In addition, with the gestalt of this operation, since transmission of a signal and reception were performed through radio, antennas (a helical antenna, flat antenna, etc.) were formed, but when performing optical communication etc., a light emitting device and a photo detector may be prepared instead of an antenna. In this case, a signal is transmitted to other communication equipment etc. by the light emitting device, and the signal from the outside is received by the photo detector.

[0172] The transmitting section 14 and a receive section 15 change into a sound signal the input signal which changed the sound signal into the sending signal and received, respectively.

[0173] Furthermore, the control section 16 is conventionally constituted by the well-known technique using CPU, memory, etc. which are not illustrated, and controls the transmitting section 14, a receive section 15 and a control unit 11, and a display 12. More specifically, an instruction is given to each control circuit, a drive circuit, etc. which were established in these each part and which are not illustrated. For example, the display-control circuit which received the display instruction from a control section 16 drives a display drive circuit, and a display is performed to a display 12.

[0174] The actuation is explained below.

[0175] First, when there is arrival of the mail, a terminating signal will be sent out to a control section 16 from a receive section 15, a control section 16 displays a predetermined character etc. on a display 12 based on the terminating signal, if the carbon button of a purport which receives arrival of the mail from a control unit 11 further is pushed, a signal will be sent out to a control section 16 and a control section 16 will set each part as arrival-of-the-mail mode. That is, while the signal received with the antenna 13 is changed into a sound signal in a receive section 15 and a sound signal is outputted as voice from a loudspeaker 10, the voice inputted from the microphone 9 is changed into a sound signal, and is sent out outside through an antenna 13 through the transmitting section 14.

[0176] Next, the case where it sends is explained.

[0177] First, when sending, the signal of a purport sent from a control unit 11 is inputted into a control section 16. Then, if the signal equivalent to the telephone number is sent to a control section 16 from a control unit 11, a control section 16 sends out the signal corresponding to the telephone number from an antenna 13 through the transmitting section 14. If the communication link with the other party is established and a signal to that effect will be sent to a control section 16 through a receive section 15 by the sending-out signal through an antenna 13, a control section 16 will set each part as dispatch mode. That is, while the

signal received with the antenna 13 is changed into a sound signal in a receive section 15 and a sound signal is outputted as voice from a loudspeaker 10, the voice inputted from the microphone 9 is changed into a sound signal, and is sent out outside through an antenna 13 through the transmitting section 14.
[0178] In addition, although the gestalt 3 of operation showed the example which carried out [voice] the transmit receive, effectiveness with the same said of the personal digital assistant which performs either [at least] transmission of data other than voice, such as not only voice but alphabetic data, or reception can be acquired.
[0179] In the personal digital assistant by the gestalt 3 of such operation, since the efficient luminescence engine performance is maintainable, the amount of the power used, such as a dc-battery, can be controlled. It is possible for this to attain lightweight-ization according to the miniaturization of a dc-battery in to enable long duration use of a personal digital assistant ****. It is called for that the display device used especially for a personal digital assistant is high definition more, and it is a low power, and high definition and efficient-ization bring about a big merit in recent years compared with the optical ejection of the conventional organic electroluminescent element. By efficient-ization, streamlining of cell capacity is attained and lightweight-izing and long time-ization can be attained. Moreover, as a substrate of an organic electroluminescent element, if a high polymer film is used, it will become possible to bring about fast lightweight-ization.
[0180] moreover, the personal digital assistant aiming at an object for individual treatment like a personal digital assistant -- setting -- a user -- only he can recognize information and the property that information cannot be recognized is demanded from the perimeter. Since it is possible to make orientation of light strong in the direction of a transverse plane in the display device in this invention, it is very effective to an application which was described above.
[0181]
[Example] (Example 1) On the opaque substrate which consists of composite material of a polycarbonate and polyimide, transparence NEGAREJISUTO material (refractive index 1.5) was applied with the spin coat method, the resist film with a thickness of 100 micrometers was formed, and the reverse V typeface structure which is 40-50 degrees of taper angles of the reverse V typeface structure was formed by heating for 1 hour in a mask and the oven which exposed and developed negatives, carried out patterning of the resist film to the predetermined configuration, and heated this at 220 degrees C.
[0182] next, ultrasonic cleaning for [it twists this substrate in a detergent (fruity chemistry company make and SEMIKO -- clean)] 5 minutes -- Ultrasonic cleaning for [it is based on pure water] 10 minutes, ultrasonic cleaning for [it is based on the solution which mixed hydrogen peroxide solution 1 and water 5 to aqueous ammonia 1 (volume ratio)] 5 minutes, After carrying out washing processing at the order of ultrasonic cleaning for [it is based on 70-degree C pure water] 5 minutes, by the nitrogen blower, the moisture adhering to a substrate was removed, and it heated further and dried.
[0183] Next, the cathode by which patterning was carried out with the metal mask by making the aluminum-Li alloy containing 15at% Li into the source of vacuum evaporationo within the resistance heating vacuum evaporationo equipment which decompressed the substrate with V character mold structure to the degree of vacuum of 2x10 to 6 or less Torrs was formed by 150nm thickness.
[0184] Next, similarly, within resistance heating vacuum evaporationo equipment, Alq3 was formed by about 60nm thickness as a luminous layer on cathode, and TPD was formed by about 50nm thickness as an electron hole transportation layer on the luminous layer. In addition, both the evaporation rates of TPD and Alq3 were 0.2 nm/s.
[0185] Next, within the low damage spatter equipment decompressed to the degree of vacuum of 2x10 to 6 or less Torrs, the mask was carried out with the metal mask and the ITO film of 160nm of thickness was formed on the electron hole transportation layer.
[0186] Next, the silicon nitride film of 3 micrometers of thickness was similarly formed as a protective coat on the organic toothing-like electroluminescent element within low damage spatter equipment.
[0187] Next, the reflective film of the 100nm thickness by which patterning was carried out to the configuration of the reverse V typeface structure with the metal mask by making aluminum into the source of vacuum evaporationo within the resistance heating vacuum evaporationo equipment which decompressed the organic electroluminescent element in which the protective coat was formed to the degree of vacuum of 2x10 to 6 or less Torrs was formed.
[0188] (Example 2) On the transparence substrate which consists of a polycarbonate, transparence NEGAREJISUTO material (refractive index 1.5) was applied with the spin coat method, the resist film with a thickness of 100 micrometers was formed, and the reverse V typeface structure which is 40-50 degrees of

taper angles of the reverse V typeface structure was formed by heating for 1 hour in a mask and the oven which exposed and developed negatives, carried out patterning of the resist film to the predetermined configuration, and heated this at 220 degrees C.
[0189] next, ultrasonic cleaning for [it twists this substrate in a detergent (fruity chemistry company make and SEMIKO -- clean)] 5 minutes -- Ultrasonic cleaning for [it is based on pure water] 10 minutes, ultrasonic cleaning for [it is based on the solution which mixed hydrogen peroxide solution 1 and water 5 to aqueous ammonia 1 (volume ratio)] 5 minutes, After carrying out washing processing at the order of ultrasonic cleaning for [it is based on 70-degree C pure water] 5 minutes, by the nitrogen blower, the moisture adhering to a substrate was removed, and it heated further and dried.
[0190] Next, the cathode by which patterning was carried out with the metal mask by making the aluminum-Li alloy containing 15at% Li into the source of vacuum evaporationo within the resistance heating vacuum evaporationo equipment which decompressed the substrate with V character mold structure to the degree of vacuum of 2x10 to 6 or less Torrs was formed by 150nm thickness.
[0191] Next, similarly, within resistance heating vacuum evaporationo equipment, Alq3 was formed by about 60nm thickness as a luminous layer on cathode, and TPD was formed by about 50nm thickness as an electron hole transportation layer on the luminous layer. In addition, both the evaporation rates of TPD and Alq3 were 0.2 nm/s.
[0192] Next, within the low damage spatter equipment decompressed to the degree of vacuum of 2x10 to 6 or less Torrs, the mask was carried out with the metal mask and the ITO film of 160nm of thickness was formed on the electron hole transportation layer.
[0193] Next, the silicon nitride film of 3 micrometers of thickness was similarly formed as a protective coat on the organic toothing-like electroluminescent element within low damage spatter equipment.
[0194] Next, UV hardening mold transparence resin (refractive index 1.6) was applied to the organic electroluminescent element front face of the shape of toothing protected by this protective coat, it considered as the flattening structure of 200-micrometer thickness with the 200-micrometer flattening jig with a spacer, UV irradiation was carried out to this, and it hardened.
[0195] (Example 3) The TFT array with which each pixel electrode which consists of Cr was connected to the signal line through TFT which consists of amorphous silicon on the transparence substrate which consists of glass was formed.
[0196] Next, NEGAREJISUTO material was applied to this TFT array substrate front face with the spin coat method, the resist film with a thickness of 5 micrometers was formed in it, and the nonluminescent section without a pixel electrode was used as the mask and the TFT array substrate which was exposed, developed negatives and covered only the nonluminescent section with the resist film.
[0197] next, after carrying out washing processing of this TFT array substrate at the order of ultrasonic cleaning for [it is based on a detergent (fruity chemistry company make and SEMIKO -- clean)] 5 minutes, and ultrasonic cleaning for [it is based on pure water] 10 minutes, by the nitrogen blower, the moisture adhering to a substrate was removed, and it heated further and dried.
[0198] next, the inside of the resistance heating vacuum evaporationo equipment decompressed on the front face of a TFT array substrate to the degree of vacuum of 2x10 to 6 or less Torrs -- aluminum -- about 100-micrometer thickness -- forming -- this array substrate front face -- resist material (Tokyo adaptation shrine make, OFPR- 800) -- a spin coat method -- applying -- the resist film with a thickness of 10 micrometers -- forming -- a mask -- negatives were exposed and developed, and patterning of the resist film was carried out so that the nonluminescent section might be covered. Next, this substrate was immersed into 50% of aluminum etchant at 60 degrees C, after etching aluminum film of a part with which the resist film is not formed and carrying out over etching in etchant while it is still more for a while, the resist film was also removed and the TFT array substrate which consists of aluminum which serves as 30-50 degrees of taper angles of the reverse V typeface structure at the nonluminescent section and with which the reverse V typeface structure was formed was obtained.
[0199] Next, after carrying out washing processing at the order of ultrasonic cleaning for [it is based on 70-degree C pure water] 5 minutes, by the nitrogen blower, the moisture adhering to a substrate was removed, and it heated further and dried.
[0200] Next, the cathode by which patterning was carried out with the metal mask by making the aluminum-Li alloy containing 15at% Li into the source of vacuum evaporationo within the resistance heating vacuum evaporationo equipment which decompressed the substrate with V character mold structure to the degree of vacuum of 2x10 to 6 or less Torrs was formed by 150nm thickness.
[0201] Next, similarly, within resistance heating vacuum evaporationo equipment, Alq3 was formed by

about 60nm thickness as a luminous layer on cathode, and TPD was formed by about 50nm thickness as an electron hole transportation layer on the luminous layer. In addition, both the evaporation rates of TPD and Alq3 were 0.2 nm/s.

[0202] Next, within the low damage spatter equipment decompressed to the degree of vacuum of 2x10 to 6 or less Torrs, the mask was carried out with the metal mask and the ITO film of 160nm of thickness was formed on the electron hole transportation layer.

[0203] Next, the silicon nitride film of 3 micrometers of thickness was similarly formed as a protective coat on the organic toothing-like electroluminescent element within low damage spatter equipment.

[0204] Next, transparence resist material was applied to the organic electroluminescent element front face of the shape of toothing protected by this protective coat, it considered as the flattening structure of 200-micrometer thickness with the 200-micrometer flattening jig with a spacer, and heat hardening was carried out in the oven which heated this at 100 degrees C.

[0205] (Example 1 of a comparison) the ITO film top after forming the ITO film of 160nm of thickness like an example 1 on the transparence substrate which consists of glass -- resist material (Tokyo adaptation shrine make, OFPR- 800) -- a spin coat method -- applying -- the resist film with a thickness of 10 micrometers -- forming -- a mask -- negatives were exposed and developed and patterning of the resist film was carried out to the predetermined configuration. Next, this substrate was immersed into 50% of hydrochloric acid at 60 degrees C, after etching the ITO film of a part with which the resist film is not formed, the resist film was also removed and the patterning substrate with which the anode plate which consists of ITO film of a predetermined pattern was formed was obtained.

[0206] next, ultrasonic cleaning for [it twists this patterning substrate in a detergent (fruity chemistry company make and SEMIKO -- clean)] 5 minutes -- Ultrasonic cleaning for [it is based on pure water] 10 minutes, ultrasonic cleaning for [it is based on the solution which mixed hydrogen peroxide solution 1 and water 5 to aqueous ammonia 1 (volume ratio)] 5 minutes, After carrying out washing processing at the order of ultrasonic cleaning for [it is based on 70-degree C pure water] 5 minutes, by the nitrogen blower, the moisture adhering to a substrate was removed, and it heated further and dried.

[0207] Next, TPD was formed in the front face by the side of the anode plate of a patterning substrate by about 50nm thickness as an electron hole transportation layer within the resistance heating vacuum evaporationo equipment decompressed to the degree of vacuum of 2x10 to 6 or less Torrs.

[0208] Next, Alq3 was similarly formed by about 60nm thickness as a luminous layer on the electron hole transportation layer within resistance heating vacuum evaporationo equipment. In addition, both the evaporation rates of TPD and Alq3 were 0.2 nm/s.

[0209] Next, cathode was similarly formed by 150nm thickness within resistance heating vacuum evaporationo equipment by making into the source of vacuum evaporationo the aluminum-Li alloy which contains 15at(s)% Li on a luminous layer.

[0210]

[Table 1]

	発光効率	発光面視認性
実施例1	○	○
実施例2	◎	◎
実施例3	◎	◎
比較例1	△	△

[0211] Here, the evaluation approach in the evaluation criteria of (Table 1) and its valuation basis are explained.

[0212] The luminous efficiency of a component evaluated the luminescence brightness when passing a fixed current to an organic electroluminescent element. the valuation basis -- the luminescence brightness of the example 1 of a comparison -- receiving -- O: -- it excels very much -- O: excel -- it can do **:permission -- it comes out.

[0213] The visibility of a luminescence side evaluated extent of visibility by viewing about the blot of light when using an organic electroluminescent element as the image formation equipment which consists of a 300-micrometer pixel, and dotage. evaluation -- three-step evaluation of O, O, and ** -- it is -- the valuation basis -- O: -- it excels very much -- O: excel -- it can do **:permission -- it comes out.

[0214] Each organic electroluminescent element of examples 1, 2, and 3 brought the result of having excelled altogether, in luminescence brightness and luminescence side visibility to the organic electroluminescent element of the example 1 of a comparison so that clearly from (Table 1). Especially, in examples 2 and 3, the result that luminescence brightness and luminescence side visibility excelled very much compared with the example 1 of a comparison was brought. It turns out to the example of a comparison that the organic electroluminescent element of this example is an organic electroluminescent element which whose luminous efficiency was high and was excellent in visibility notably.
[0215]
[Effect of the Invention] As mentioned above, according to the organic electroluminescent element of this invention, the following advantageous effectiveness is acquired.
[0216] According to invention according to claim 1, since the reverse V typeface structure higher than a luminous layer is formed in a part of component forming face [at least] of (1) substrate, the light emitted into air from opening reaches said reverse V typeface structure, the brightness of the direction of a transverse plane improves and effectual component effectiveness goes up by the orientation of light changing.
[0217] (2) Since both the light directly emitted from a component and the light emitted by reflecting by the reverse V typeface structure are visible when a component is seen from a transverse plane, the luminescence area of the appearance of a component becomes large.
[0218] According to invention according to claim 2, the orientation and ejection effectiveness of light improve by making into a flat surface the concave heights formed of the (1) reverse V typeface structure by the transparence flattening structure formed with the transparent ingredient in addition to the effectiveness of claim 1.
[0219] (2) Since the stacking tendency of light becomes good and the brightness of the direction of a transverse plane improves, effectual component effectiveness increases very much.
[0220] (3) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0221] (4) By making a component front face flat, the reinforcement of a component improves and there is effectiveness of dust being unable to adhere easily.
[0222] (5) Since flattening structure is thin enough, it is hard to produce a blot of light etc.
[0223] Since according to invention according to claim 3 in addition to claim 1 or the effectiveness of 2 the (1) reverse V typeface structure forms mesa mold structure and it is formed with the ingredient which reflects light, it is reflected efficiently and the ejection effectiveness and transverse-plane brightness of light of light improve.
[0224] (2) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0225] (3) Like [in the case of transparence], since it is not necessary to take a refractive index into consideration, the degree of freedom of ingredient selection tends to raise effectiveness to lightweight-ization etc. highly.
[0226] according to invention according to claim 4 -- the effectiveness of claim 2 -- adding -- the (1) reverse V typeface structure -- the transparence flattening structure -- low -- since it is formed with the refractive index ingredient, total reflection of the light is carried out on the side face of mesa structure, and the ejection effectiveness and the transverse-plane brightness of light improve.
[0227] (2) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0228] (3) Like a reflector, since it is not reflection by surface reflection, a reflective loss is small.
[0229] (4) By designing a refractive index, it is possible to reduce the effect of the stray light.
[0230] (5) Since it is transparence, it is possible to form not only in the periphery of a pixel but in the interior of a pixel.
[0231] According to invention according to claim 5, among claim 2 thru/or 4, since in addition to any 1 effectiveness (1) protective coat is formed and the transparence flattening film is formed in the top face, organic electroluminescence can be manufactured, without giving damages, such as heat and stress, to a transparent electrode and a lower organic layer.
[0232] (2) The formation approach and formation ingredient which are formed on a protective coat can be chosen freely.
[0233] (3) Since the protective coat is formed, an organic electroluminescent element can be intercepted from the open air, and excel in long duration stability.

[0234] According to invention according to claim 6, among claim 1 thru/or 5, since the (1) reverse V typeface structure is formed in the configuration symmetrical [concavo-convex structure] in addition to any 1 effectiveness, directivity strong against the direction of a transverse plane can be given for the orientation of light.
[0235] (2) Since the directivity of light can be controlled and the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0236] (3) Since how when leaning in a longitudinal direction and the vertical direction to be visible is the same, there is no fault, like an eye gets tired and excel in visibility.
[0237] (4) Don't need a complicated optical design and creation of the structure is also easy.
[0238] according to invention according to claim 7 -- claim 1 thru/or the inside any 1 effectiveness of 5 -- adding -- the (1) reverse V typeface structure -- concavo-convex structure -- right and left -- since it is formed in the unsymmetrical configuration, the direction of orientation of light is changed -- it can make -- concavo-convex structure -- right and left -- light can be made to emit isotropic by arranging asymmetrically and at random
[0239] (2) Since the effect to outdoor daylight can be reduced and the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0240] (3) By designing the inclination of a V in all typeface slot in area, it is possible to give special vision properties, such as to sense brighter than actual luminescence.
[0241] (4) Since you may shift somewhat, creation is easy and the yield also becomes high.
[0242] since the (1) reverse V typeface structure is formed [according to invention according to claim 8] in the shape of a straight line among claim 1 thru/or 7 in addition to any 1 effectiveness -- a design and formation of structure -- ** -- it can do easily.
[0243] (2) Since the reverse V typeface structure is linear mesa structure, the ejection effectiveness of light improves.
[0244] (3) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0245] According to invention according to claim 9, among claim 1 thru/or 7, since the cross-section configuration of the (1) reverse V typeface structure is formed in the **** rounded configuration inside in addition to any 1 effectiveness, it can form easily.
[0246] (2) Since the cross-section configuration of the reverse V typeface structure is the rounded mesa structure where it is **** inside, according to the include angle of the light which arrives at a side face, light can be taken out efficiently.
[0247] (3) Since the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0248] According to invention according to claim 10, since the optical loss inside (1) component can be decreased, the efficient luminescence engine performance can be maintained and good lighting in a simple matrix method can be performed.
[0249] (2) The reverse V typeface structure can be arranged to a part for plow Mabe of a matrix-like electrode, and it is possible to raise luminous efficiency effectively.
[0250] According to invention according to claim 11, since the optical loss inside (1) component can be decreased, the efficient luminescence engine performance can be maintained and good lighting in an active-matrix method can be performed.
[0251] (2) The reverse V typeface structure can be arranged into the crevice between each pixel, and parts, such as the switching element upper part, and it is possible to raise luminous efficiency effectively.
[0252] According to invention according to claim 12, in addition to claim 10 or the effectiveness of 11, physical relationship of a light-emitting part and the reverse V typeface structure can be made the same, the same improvement effectiveness in ejection effectiveness is acquired in every pixel, and a good image can be obtained by making the same the pitch of the (1) reverse V typeface structure, and the pitch of a pixel.
[0253] (2) Since opening in a pixel can be arranged effectively and the optical loss inside a component can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.
[0254] If the height of (1) transparence flattening structure is made below into the sum of the height of said reverse V typeface structure, and the width of face of the direction of a flat surface of a pixel in addition to claim 10 or the effectiveness of 11, since effect of the stray light can be made small according to invention according to claim 13, faults, such as a fall of contrast, and an optical blot, dotage, do not happen.
[0255] (2) Since the light which advances into other pixels can be decreased, the efficient luminescence engine performance excellent in visibility is maintainable.

[0256] According to invention according to claim 14, since the optical loss inside (1) component can be decreased, the efficient luminescence engine performance can be maintained and lightweight-izing or the formation of a long time by streamlining of cell capacity etc. can be attained.
[0257] (2) By designing a vision property (orientation of light) suitably, it can use according to an application as a private window hard to see, a window where even two or more persons are legible from a perimeter.

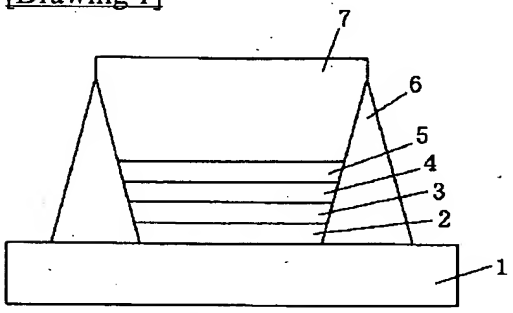
[Translation done.]

* NOTICES *

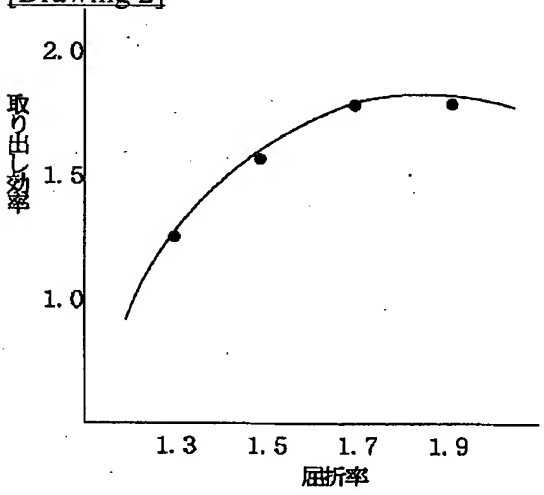
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

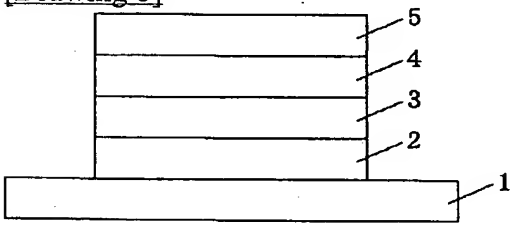
[Drawing 1]



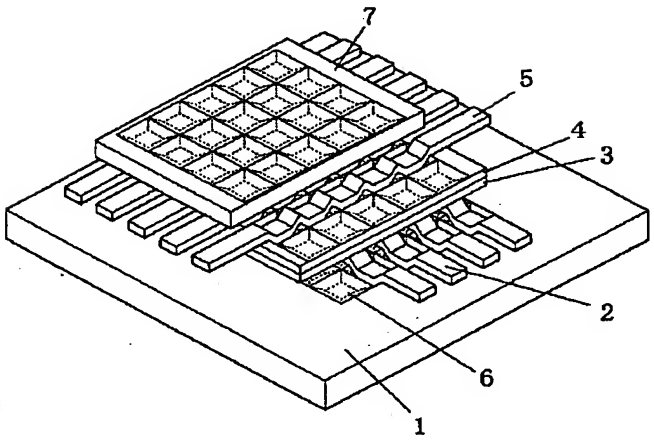
[Drawing 2]



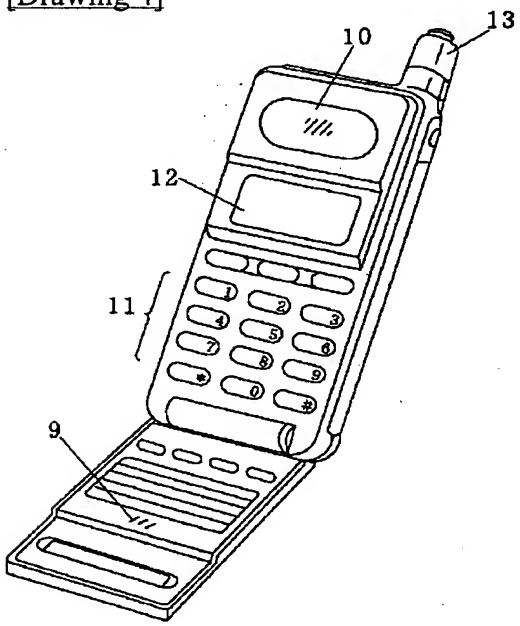
[Drawing 6]



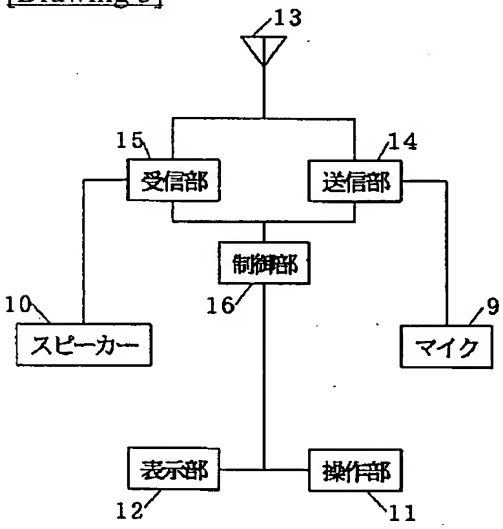
[Drawing 3]



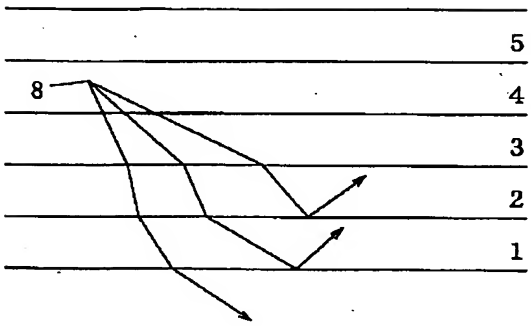
[Drawing 4]



[Drawing 5]



[Drawing 7]



[Translation done.]